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# **A New Exploration Strategy**

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# Why We Explore

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- **More tangible benefits:**
  - **Credible plans for science**
  - **Technology for space and Earth**
  - **Economic development and industrial capability**
  - **Exploration Preparation**
- **Less tangible benefits**
  - **U.S. leadership of international ventures**
  - **Engagement of the public**
  - **Inspiration of the youth, and excitement about STEM**

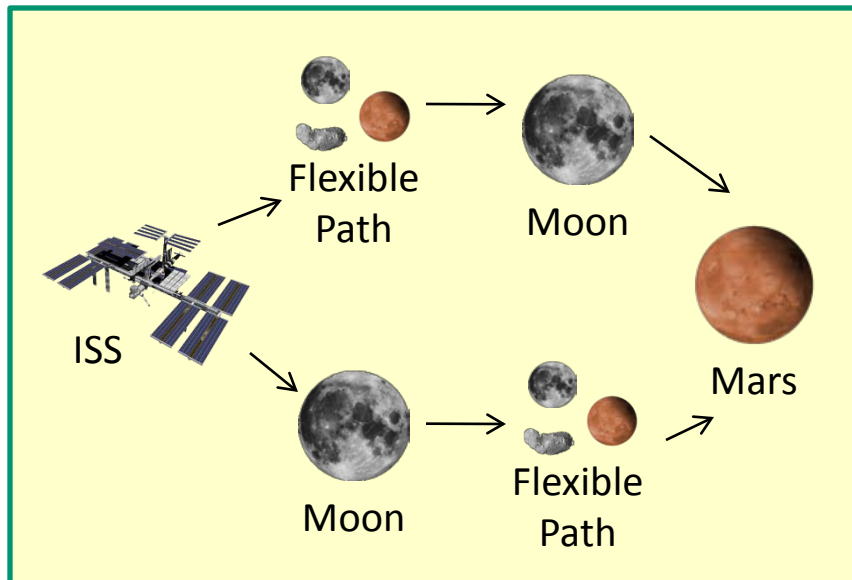
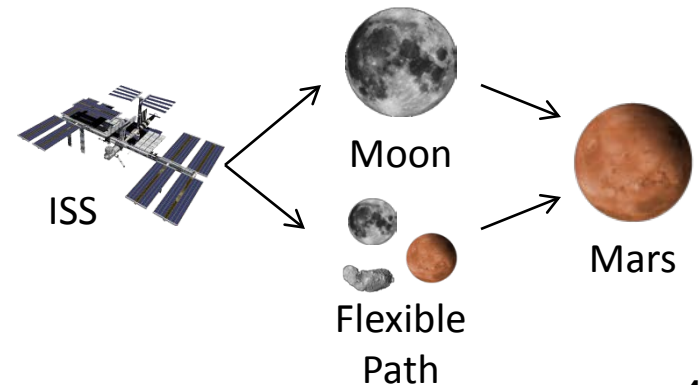
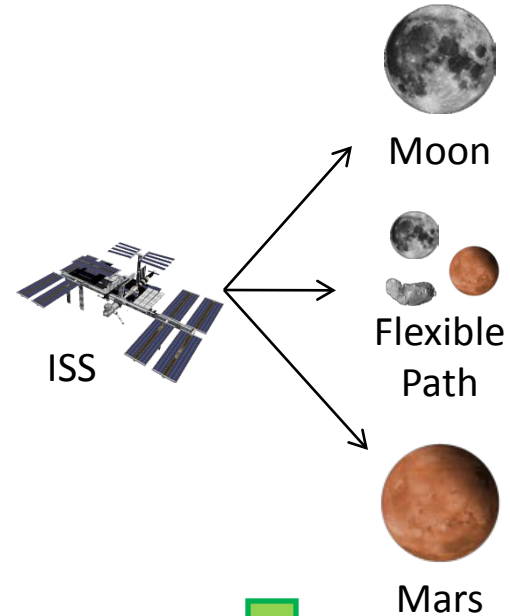
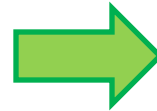
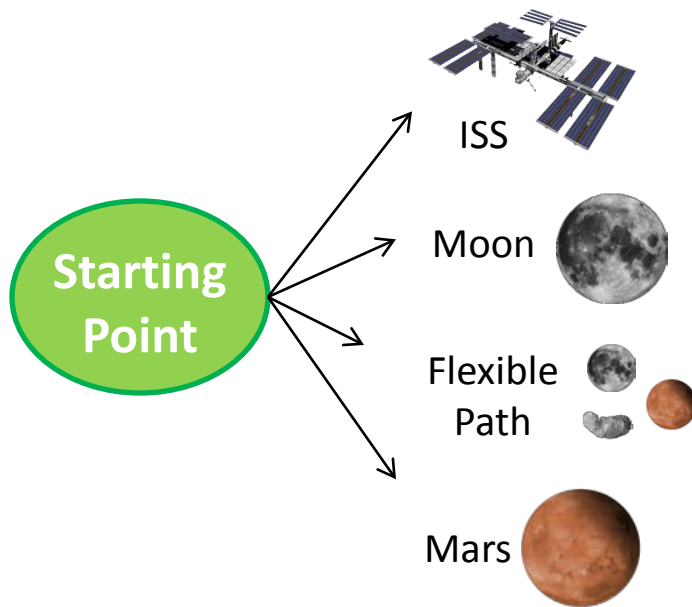
# A Space Faring Civilization

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- We explore to chart a path for human expansion into the solar system.
- Mars should be the ultimate destination for that exploration in the inner solar system
- Staying on Mars, and extending human civilization within the solar system should be the ultimate goal.
- This will require a lengthy commitment.
- But it is time to begin.

These goals should drive destinations and systems

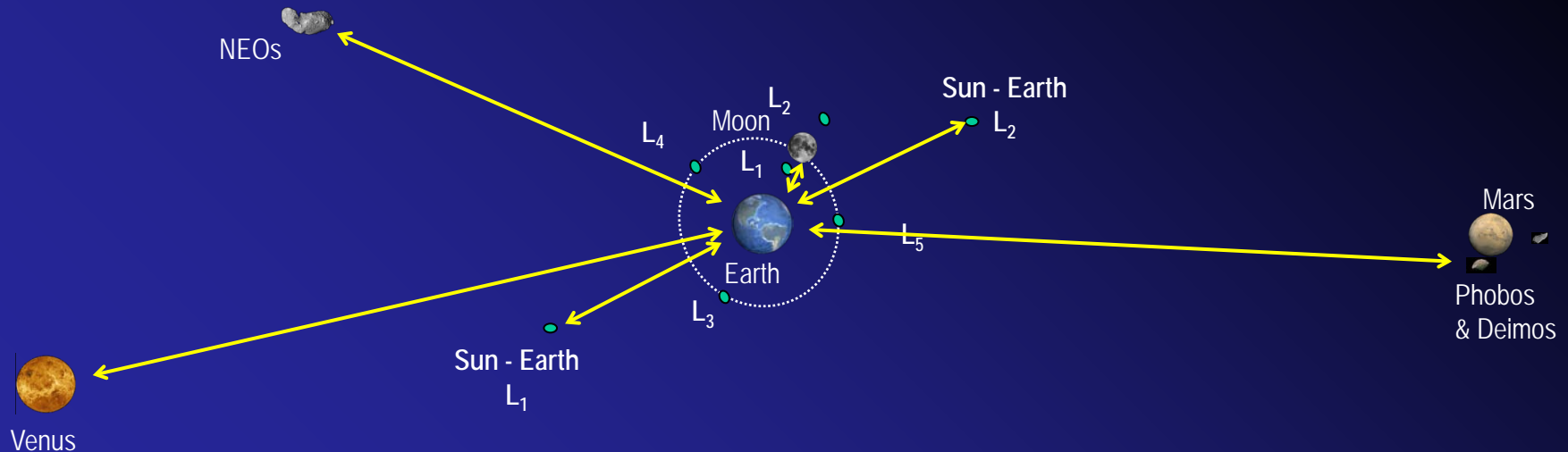
# High Level Decision Evolution of the Committee



# A New Strategy for Exploration, in Close Cooperation with Robotics

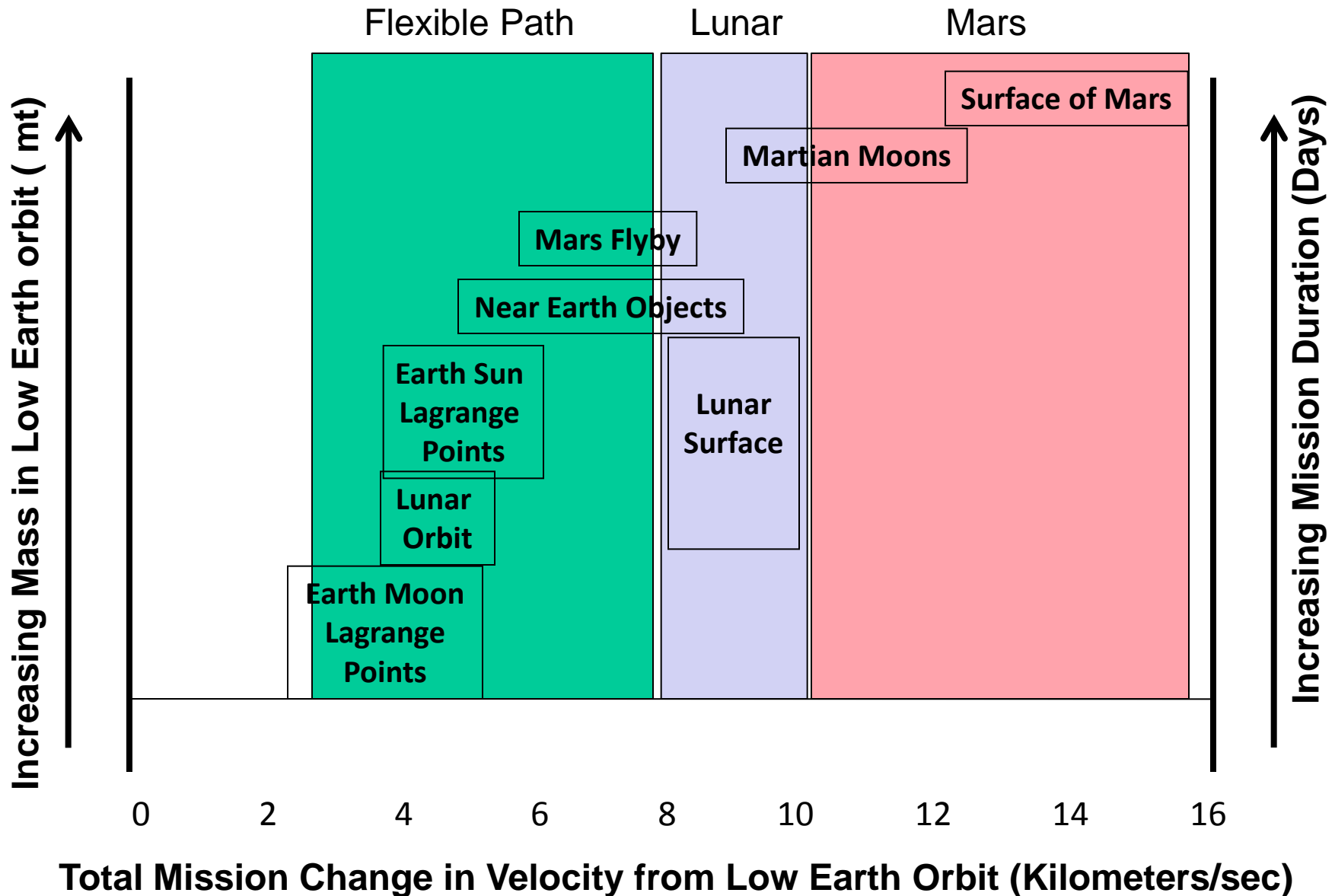
**Goal – Expand beyond the Earth – Moon system as quickly as possible, develop the capability to live and work in free space, gather science knowledge and support science operations**

- Travel to many places in the inner solar system but initially not walk on the surface
- For locations and small bodies, rendezvous and explore much like encountering the ISS or a Hubble repair
- For larger bodies, crew arrives in vicinity, scans, sends down telerobotic probes, explores through robots, collects samples launched by robots
- Explore many sites in the Solar System with essentially the same space systems

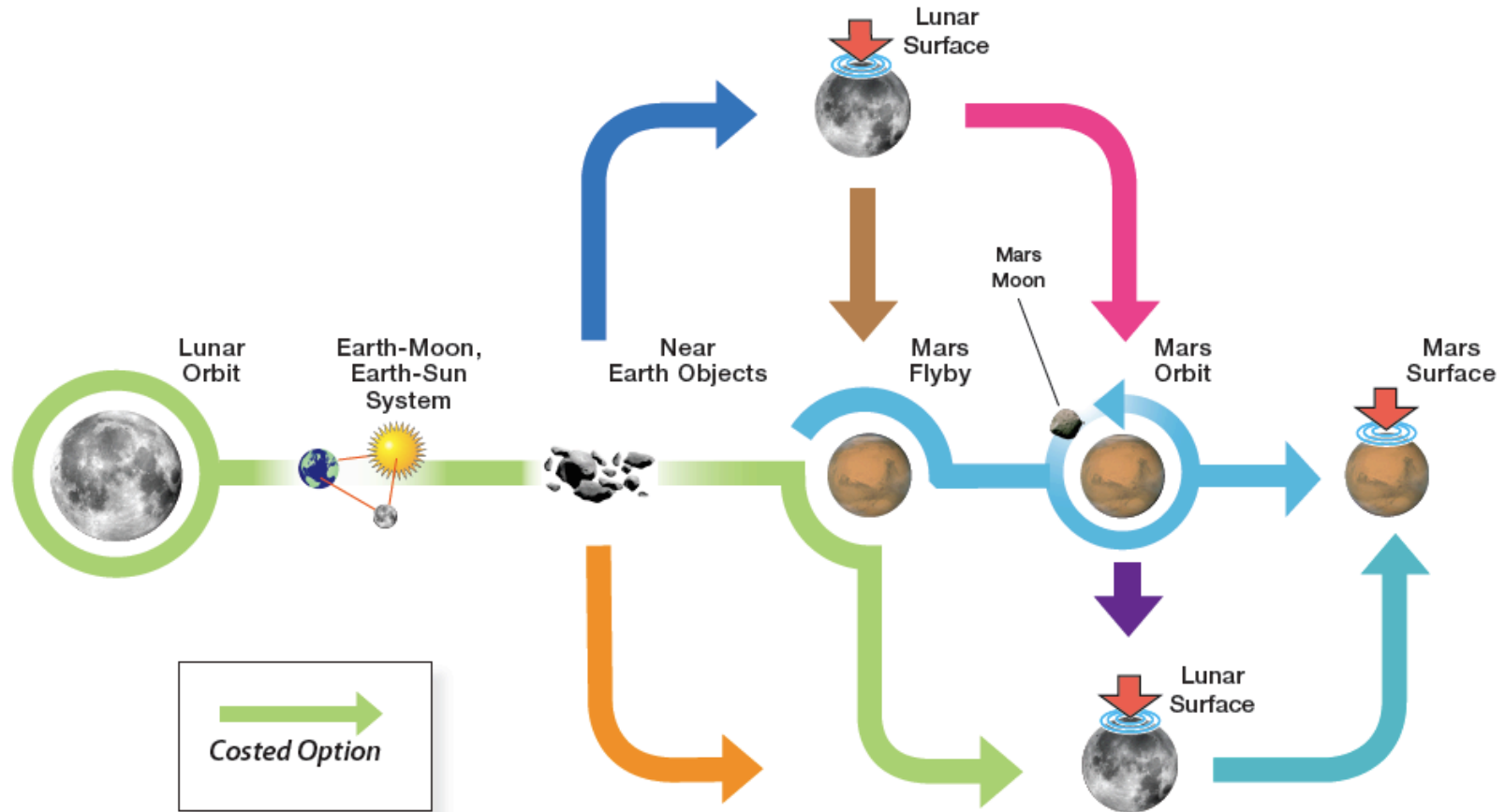


**A strategy that is flexible, enabled by capability and guided by discovery**

# Mass, Energy & Time Considerations



# Planning Flexibility on the Flexible Path to Mars and Moon



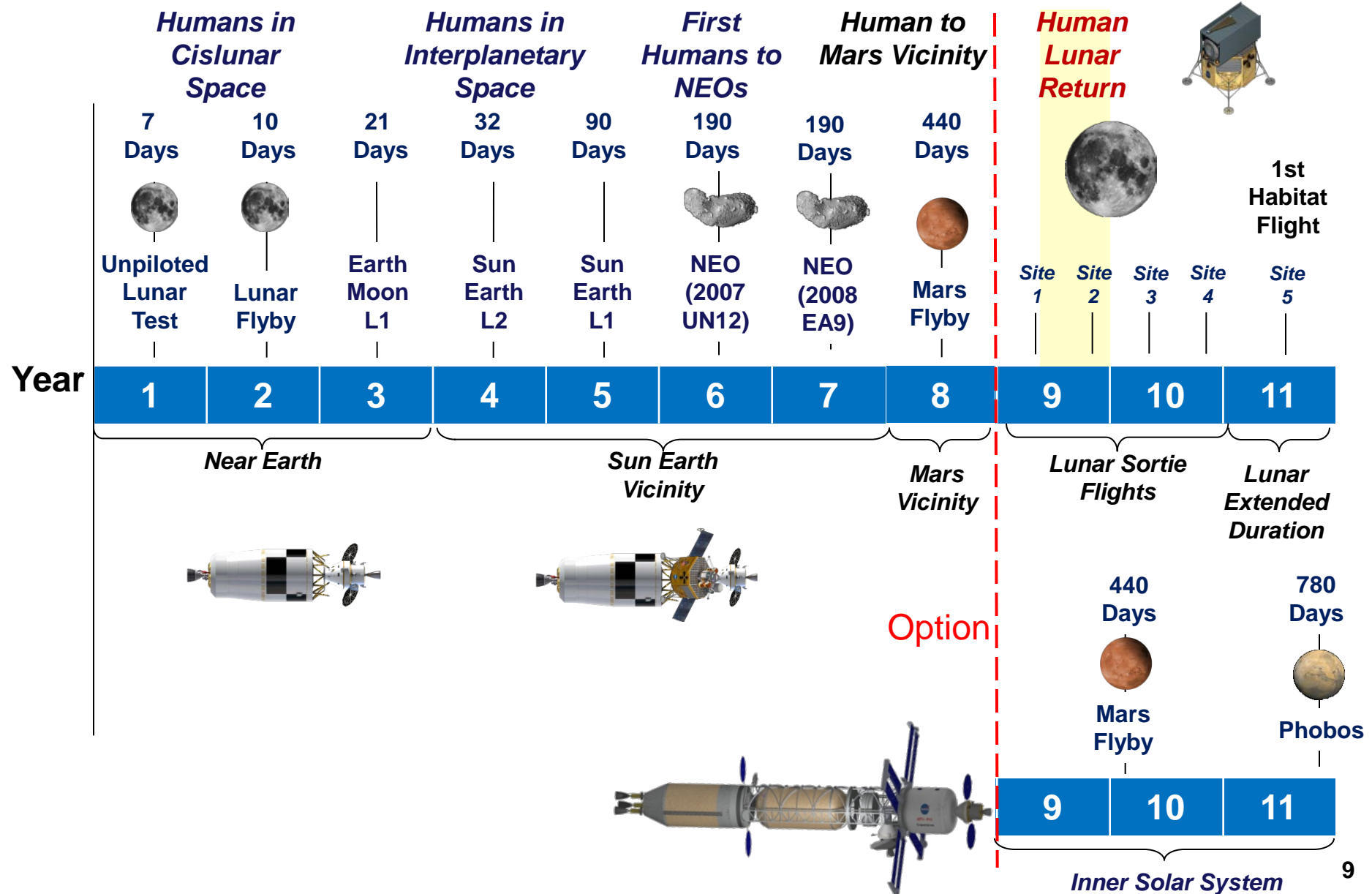
# Value Proposition for Flexible Path

Destination	Public Engagement	Science	Human Research	Exploration Preparation
Lunar Flyby/Orbit	Return to Moon, “any time we want”	Demo of human robotic operation	10 days beyond radiation belts	Beyond LEO shakedown
Earth Moon L1	“Onramp to the inter-planetary highway”	Ability to service ES L2 s/c at EM L1	21 days beyond the belts	Ops at potential fuel depot
Earth Sun L2	First human in “deep space” or “Earth escape”	Ability to service ES L2 s/c at ES L2	32 days beyond the belts	Potential servicing, test airlock
Earth Sun L1	First human “in the solar wind”	Potential for Earth/Sun science	90 days beyond the belts	Potential servicing, test in-space hab
NEO’s	“Helping protect the planet”	Geophysics, Astrobiology, Sample return	190-220 day, similar to Mars transit	Encounters with small bodies, sample handling, resource utilization
Mars Flyby	First human “to Mars”	Human robotic operations, sample return?	440 days, similar to Mars out and return	Robotic ops, test of planetary cyclor concepts
Mars Orbit	Humans “working at Mars and touching bits of Mars”	Mars surface sample return	780 days, full trip to Mars	Joint robotic/human exploration and surface ops, sample testing,
Mars Moons	Humans “landing on another moon”	Mars moons’ sample return	780 days, full rehearsal Mars exploration	Joint robotic/human surface and small body exploration



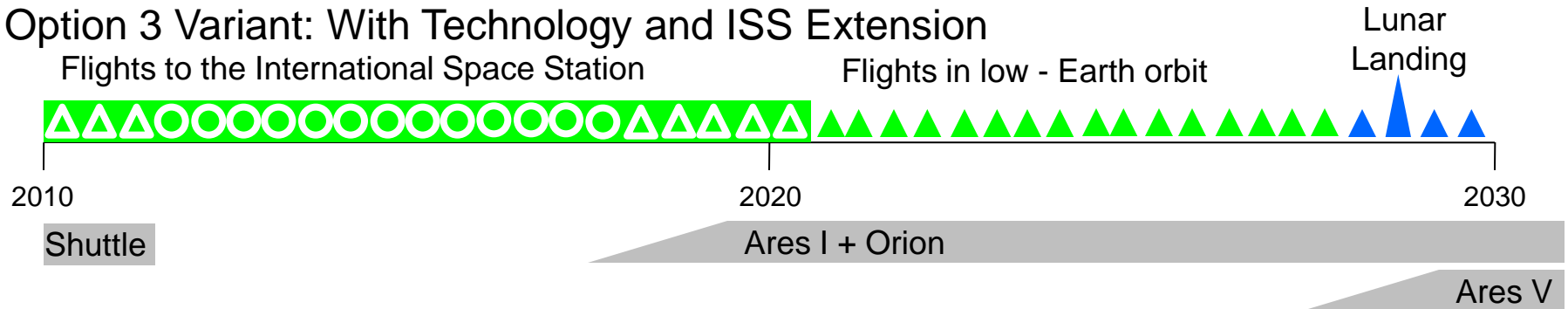
# Flexible Path to Mars and Moon

## Milestones, Destinations & Capabilities

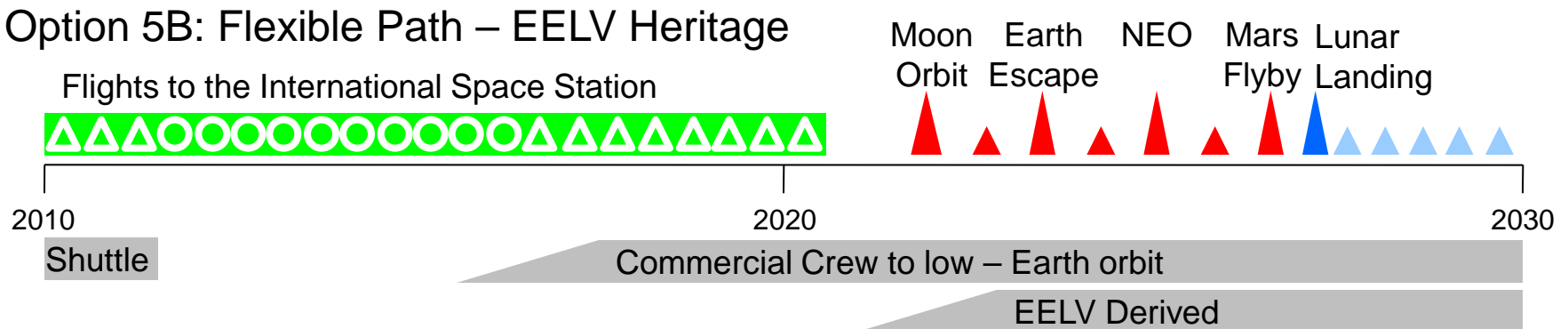


# Timelines of the Three Less Constrained Lunar Options

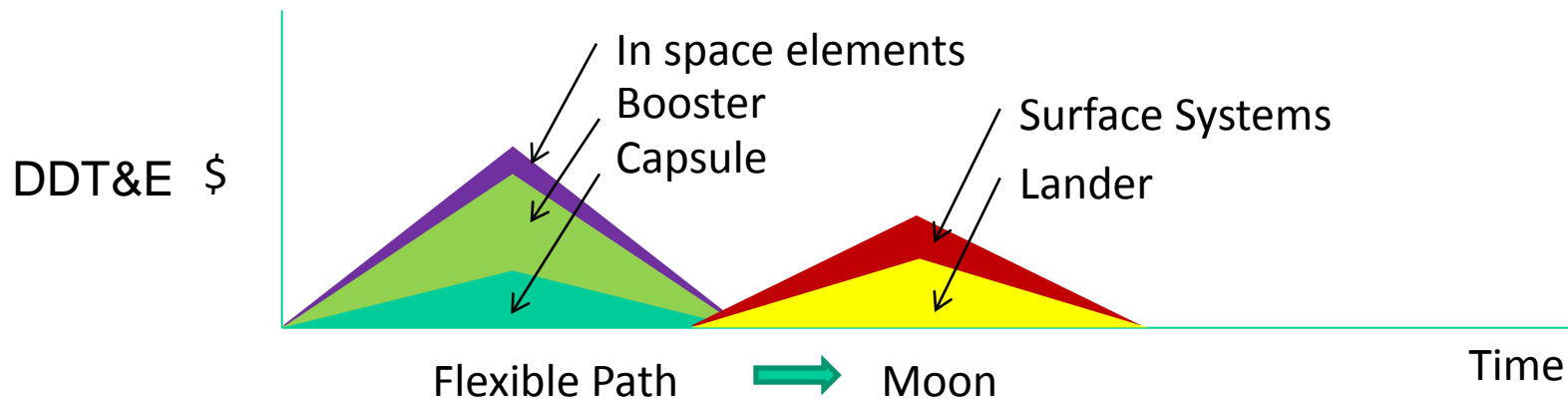
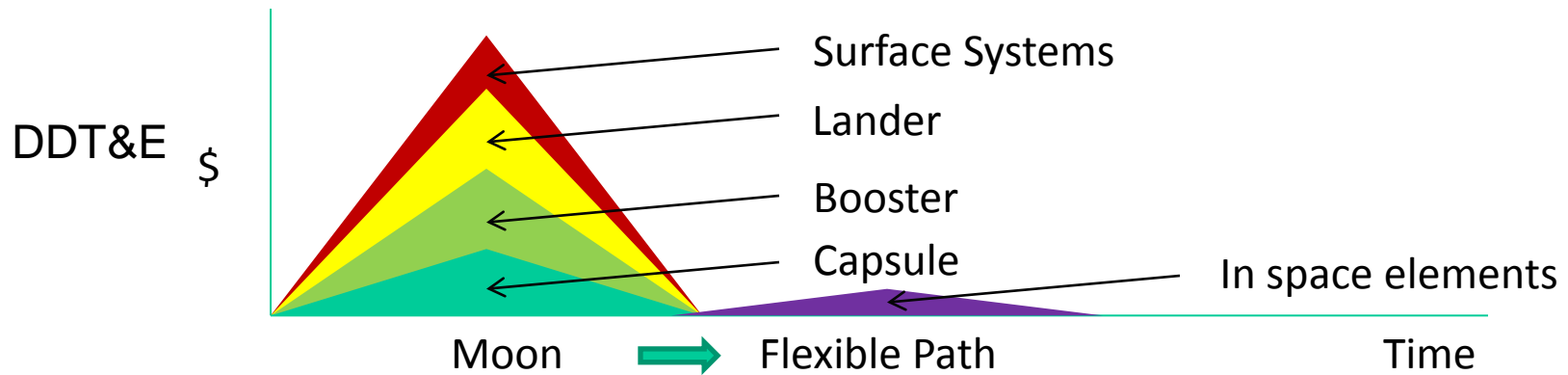
## Option 3 Variant: With Technology and ISS Extension



## Option 5B: Flexible Path – EELV Heritage



# Development and Ops Cost Phasing: Lunar vs. Flexible



- **2010's – operate the ISS, build the deep space systems**
- **2020's – operate the deep space systems, build the planetary systems**
- **2030's – operate the planetary systems**

# Summary of Benefits

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- **Faster start**
- **New destinations**
- **Regular cadence of exploration**
- **Deep space capability**
- **Authentic synthesis of humans and robotics**
- **Opportunities for interesting science**
- **Phase development profile**
- **Engaging for international partners**
- **Generational change**
- **Progress toward our ultimate goal**

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